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## Surgical Management of Tuberculous Broncholithiasis

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### ABSTRACT

**Background:** Broncholithiasis is often seen after chronic granulomatosis diseases such as tuberculosis and histoplasmosis and leads to a wide spectrum of signs and symptoms; including hemoptysis which often needs surgical management. The goal of this study is evaluation of surgery in patients with tuberculous broncholithiasis presenting with hemoptysis.

**Materials and Methods:** In this study, all patients with tuberculous broncholithiasis whom had been operated on between 1991 and 2005 and their follow-up period was at least 6 months and at most 9 years were included and studied in regard to age, sex, clinical symptoms, diagnostic methods, type of surgical procedure, complications, and mortality rate.

**Results:** Overall, 5 patients were studied; (M/F=2/3, mean age=31 years), 40% with severe and 60% with mild to moderate and recurrent hemoptysis. Lesion was at the left lung in 80% and at the right lung in 20% of patients. In 60% of patients some degrees of bronchiectasis were seen, in 80% the lesion was visible in bronchoscopy and endoscopic removal of lesion failed in all cases. Sixty percent of patients underwent pulmonary resections and in 40% broncholithectomy was done. In follow-up, patients with pulmonary resection have had no problem till now, but in patients with broncholithectomy due to the late occurrence of bronchiectasis, re-operation and pulmonary resection were unavoidable. No mortality was reported in our patients.

**Conclusion:** Regarding the risks of hemoptysis, excellent results of surgery and possible occurrence of late bronchiectasis after broncholithectomy, the results of our study showed that the procedure of choice for these lesions is pulmonary resection distal to lesion and saving as much of parenchyma as possible. Broncholithectomy should be done only in patients in whom pulmonary resection is not technically possible. But because of very low occurrence of this complication, further studies are required in this regard. (Tanaffos 2006; 5(2): 57-63)

**Key words:** Broncholithiasis, Tuberculosis, Hemoptysis, Surgery

### INTRODUCTION

Broncholithiasis is one of the infrequent complications of some pulmonary infections, for example, tuberculosis and histoplasmosis. Stones

originate from calcified peribronchial lymph nodes that erode the tracheobronchial tree, but lithoptysis occurs infrequently. The most common symptoms are persistent cough and hemoptysis, sometimes followed by findings of obstructive pneumonia (fever, chills and purulent sputum). Physical findings are nonspecific and radiologic findings are varied.

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Complications include formation of a fistula between the respiratory tract and the esophagus or aorta and obstructive pulmonary symptoms and hemoptysis. Treatment ranges from conservative management (simple observation) to bronchoscopic removal of broncholithiasis and thoracotomy for patients in whom complications such as hemoptysis, obstructive pneumonia or secondary bronchiectasis develop. (1) In our country (Iran) the most common cause of this problem is tuberculosis which is endemic here. The goal of this study was evaluation of surgical management of patients with broncholithiasis and hemoptysis due to tuberculosis.

### MATERIALS AND METHODS

In a descriptive (case series) study from 1991 to 2005, all patients with tuberculous broncholithiasis and hemoptysis in Quaem and Omid hospitals in Mashhad, were evaluated. Age, sex, the interval between the occurrence of lesion and diagnosis of tuberculosis, the interval between the first hemoptysis episode and surgery, bronchoscopic and radiologic diagnosis of lesion, patients' sputum test

for detection of tubercle bacilli, type of surgery, complications of surgery and mortality were all studied.

### RESULTS

Overall, 5 patients were included in this study. Table 1 shows the characteristics of the patients. The M/F ration was 2/3. Mean age at the time of admission was 31 years (range 18-58 yrs). Mean interval between the occurrence of hemoptysis due to broncholithiasis and termination of TB treatment was 8.5 years (at least 6 and at most 10 years). Two patients with massive hemoptysis in the last refer were operated on but in the remaining 3 patients with mild to moderate recurrent hemoptysis surgery was done.

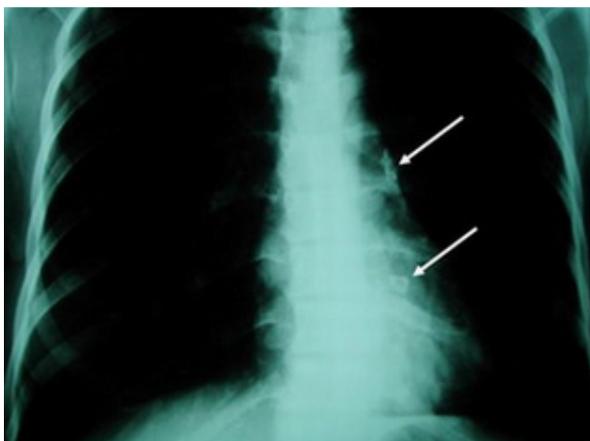
All cases had undergone medical treatment for tuberculosis with definitive diagnosis but a few years later the treatment was terminated due to formation of broncholith and hemoptysis and because of unsuccessful medical treatment surgery was indicated.

**Table 1.** Characteristics of the patients

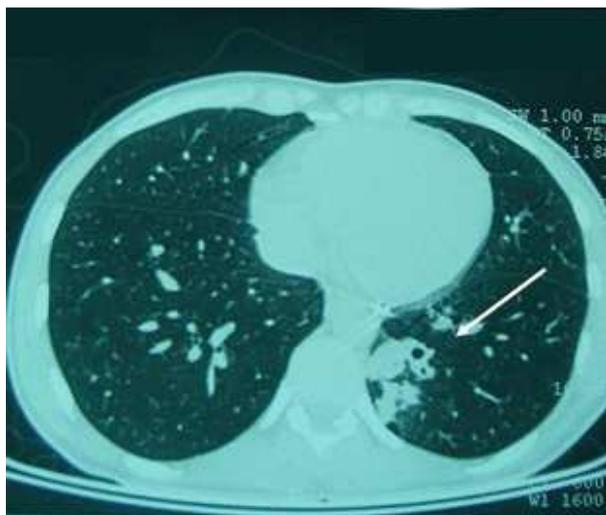
Sex	F	M	F	M	F
Age (years)	18	25	33	58	21
Duration between lesion occurrence and diagnosis of TB (years)	6	8	9	10	9.5
Type of hemoptysis	Massive	Mild to moderate	Massive	Mild to moderate	Mild to moderate
Location of lesion	Left side	Left side	Left side	Left side	Right side
Type of surgery	Pulmonary resection: (left lower lobectomy)	Pulmonary resection: (two segmentectomy in left lower lobe)	Pulmonary resection: (left lower lobectomy)	Broncholithectomy	Broncholithectomy
Complication	No	No	No	Secondary Bronchiectasis (second operation: left lower lobectomy + lingulectomy)	Secondary Bronchiectasis (second operation: right lower lobectomy)

In all patients broncholithiasis was clearly visible in chest X-ray and CT-scan.

The lesion was at the left side in 4 patients (80%) and at the right side in 1 patient (20%). In 3 patients (60%) in addition to broncholith, there were some degrees of bronchiectasis in segments distal to lesion. Figures 1 and 2 demonstrate the chest X-ray and CT-scan of a 29-year old female with tuberculous broncholithiasis and hemoptysis.



**Figure 1.** Multiple broncholithiasis (adjacent to pulmonary artery and lower lobe bronchus).



**Figure 2.** CT-scan of the same patient; bronchiectatic areas in the lower lobe are demonstrated.

Diagnostic fiberoptic bronchoscopy was done in all patients and in 4 patients (80%) erosion of broncholithiasis into the airway was clearly visible. Figure 3 shows the bronchoscopic view of the lesion in the same patient.



**Figure 3.** The bronchoscopic image of broncholithiasis

Attempting to bronchoscopic removal was unsuccessful in all patients. Sputum tests for tubercle bacilli were done in all patients prior to surgery and all were negative.

All patients underwent open surgery using posterolateral thoracotomy approach in 5th intercostal space. Three patients (60%) who had moderate to severe hemoptysis showed some degrees of bronchiectasis distal to lesion. In two patients (40%) left lower lobectomy and in one patient (20%) resection of two segments of the left lower lobe were done. Figure 4 shows the gross pathologic image of the resected specimen.

Figure 5 shows the radiographic image of the same patient after the operation.

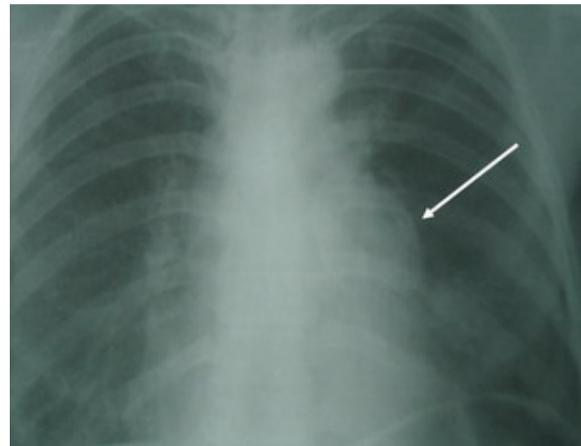
In the other two patients (40%), who had mild hemoptysis and no distal bronchiectasis in radiographic studies, only broncholithectomy and adjacent bronchial vessel ligation were done. Figure 6 shows a large broncholith within the inferior lobe bronchi.



**Figure 4.** In gross pathologic image location of broncholithiasis is clearly visible.



**Figure 5.** Postoperative radiographic image of the same patient after left lower lobectomy.

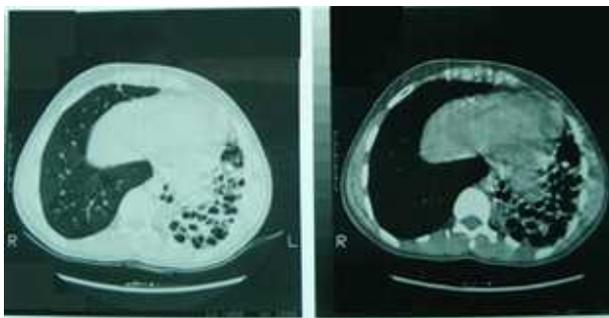


**Figure 6.** Chest X-Ray (AP and lateral view) of patient with large broncholithiasis which has been operated with broncholithectomy

At the follow up period of 6 months to 9 years, 3 patients with pulmonary resection had no problem and were almost treated. But in 2 patients with broncholithectomy alone, reoperation was done due to severe bronchiectasis and related symptoms (in one 3 years later and in the other after 6 years). In one patient left lower lobectomy plus lingulectomy and in the other right lower lobectomy were done. These two patients have had no problem till now, including no bloody sputum.

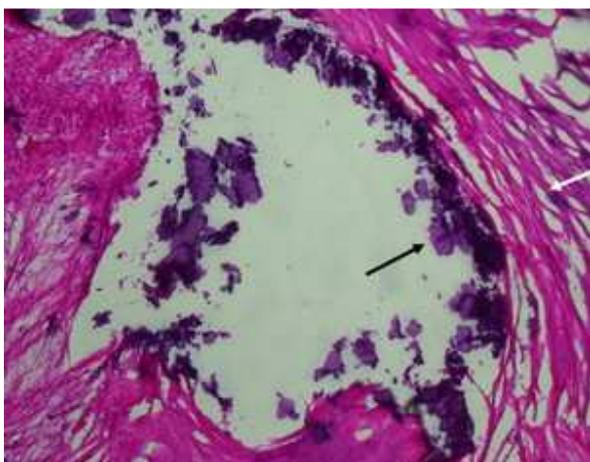
Figure 7 shows CT scan of the patient presented in figure 6 with broncholithectomy due to large broncholithiasis; the CT scan showed a delayed bronchiectasis in the left lower lobe and lingula,

presenting three years after the first surgery.



**Figure 7.** Bronchiectasis in the left lower lobe and lingula presenting three years after broncholithectomy.

In all patients, histopathologic examinations showed tuberculous broncholithiasis. Figure 8 shows the microscopic image of tuberculous broncholithiasis. No mortality was reported in our patients.



**Figure 8.** Microscopic view of broncholitis: calcification (black arrow) and fibrotic capsule (white arrow) are seen.

## DISCUSSION

Broncholithiasis is, in fact, an ossified or calcified material which has gone through bronchial lumen. The common causes of this lesion are tuberculosis and histoplasmosis.(2) It has a wide spectrum of clinical manifestations; presenting with mild

symptoms as cough and sometimes lithoptysis or complicated forms (3, 4) .

Chemical composition of broncholith is very similar to bone; it contains 85-95% calcium phosphate and 7-10% calcium carbonate (5).

Complications of broncholithiasis are different from a mild lithoptysis to more severe symptoms. One of the most dangerous complications of this lesion which almost always needs surgery is hemoptysis (6). For example, Stocia et al. reported a 51-year-old man with massive hemoptysis and broncholithiasis who was operated on (7). Similar cases have been reported by Meyer et al. They mentioned that the cause of hemoptysis is erosion of broncholithiasis through adjacent bronchial vessels which leads to severe and lethal hemoptysis in patients (8). Other complications which often need surgery in patients are obstructive pneumonia and secondary bronchiectasis, which can be presented with fever, chills, and purulent sputum (1).

Another complication of broncholithiasis which often needs surgery is bronchoesophageal fistula which is dangerous and needs a difficult operation (9).

Besides, broncholithiasis in some patients presents as middle lobe syndrome, and in all patients with such presentation, broncholithiasis should be considered (10).

Radiographic and CT-scan images of tuberculous broncholithiasis are various but often enough to make the diagnosis. Broncholithiasis is strongly suggested at CT-scan when endobronchial or peribronchial calcified node is associated with findings of bronchial obstruction. Volume data acquisition by means of helical CT with sections less than 3 mm in thickness and multiplanar reformation along the bronchial tree are helpful in confirming the endobronchial location of the calcified material. Primary endobronchial infection with dystrophic calcification, hypertrophic bronchial artery with

intramural protrusion, calcified endobronchial tumors and tracheobronchial disease with mural calcification may mimic broncholithiasis (2).

Moreover, primary endobronchial actinomycosis rarely has images very similar to broncholithiasis. In a report by Seo et al. they performed bronchoscopy and biopsy in 2 patients with presentations of broncholithiasis without history of granulomatous disease and the diagnosis of actinomycosis was approved in them (11).

Endoscopic findings consist of tracheobronchial distortion, inflammation, a visible broncholith, and bleeding. Occasionally, the patient may have endoscopic finding of a fistula in either the esophagus or the tracheobronchial tree (12).

Treatment guidelines are controversial due to small number of case reports. It is often a consensus that in asymptomatic or mild forms of disease the patients can be only observed or the broncholithiasis can be removed bronchoscopically. Huang CC et al. reported successful removal of broncholithiasis in their patients (13). Similar results have been reported by Menivale et al. as in asymptomatic or mild forms of the disease they removed these lesions by bronchoscope. In fact this method was considered as the ideal treatment in these groups of patients (14). But in our study, endoscopic removal of lesion was not successful.

The most detailed study about indications of surgery was discussed by Trastek et al. in which 54 patients with broncholithiasis were studied. Indications of surgery were: severe or recurrent hemoptysis, symptoms of distal obstruction (infection with fever and purulent sputum) or esophagobronchial fistula (15). Other investigators also mention the same indications for surgery (13, 14, 16).

There are different opinions in regard to surgical technique, from simple broncholithectomy to pulmonary resection and saving maximum of

parenchyma.

Trastek et al. have had the most complete study and believe that operation of these patients is very dangerous due to severe adhesions. The standard goal of surgery is removal of calcified masses with destroyed lung or bronchi because of late complications of bronchi destruction (pneumonia, pulmonary abscess or bronchiectasis). Pulmonary resection and saving maximum of parenchyma is preferred to broncholithectomy (15).

In another study, Cole et al. mentioned that attempting to pulmonary resection in these patients should be with control of proximal pulmonary vessels. In cases in whom pulmonary resection is not possible due to severe adhesion, opening of mass capsule and cauterizing its contents can prevent lethal complications during surgery (16).

In our study, we performed pulmonary resection with saving maximum of parenchyma in 60% of our patients and in 40% simple broncholithectomy was done. But in the follow-up due to secondary bronchiectasis, we had to do re-operation and lobectomy was done in both, in fact simple broncholithectomy without pulmonary resection is not enough for treatment and is accompanied with late complications which lead to re-operation in these patients.

In severely ill patients who can not tolerate the surgery and the lesion cannot be removed with bronchoscopy, use of Yttrium-aluminum has some benefits.

## **CONCLUSION**

Because hemoptysis is a dangerous complication in tuberculous broncholithiasis, we recommend surgery in all patients since the endoscopic removal is often unsuccessful and leads to delay in the treatment course. Besides, due to chronicity of lesions, the disturbing effects in the affected bronchi and preventing secondary bronchiectasis in patients,

our advice is to perform pulmonary resection distal to lesion with saving maximum parenchyma. Broncholithectomy alone is done only in patients in whom pulmonary resection is technically impossible. But because of the very low occurrence of this complication further studies are required in this regard.

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